595 Market Street
29th Floor
San Francisco, CA 94105

August 11, 2017 – via e-mail to Jeffrey Kwan
California Public Utilities Commission
505 Van Ness Ave
San Francisco, CA

Dear Mr. Kwan,

Sunrun Inc. ("Sunrun")[1] has been involved with the collaborative efforts between the California Public Utilities Commission ("CPUC"), the California Energy Commission, and other stakeholder groups in Smart Inverter Working Group ("SIWG") to develop advanced inverter functionality as an important strategy to mitigate the impact of high penetrations of distributed energy resources ("DERs"). Therefore, Sunrun appreciates the opportunity to comment on the Energy Division's "*Staff Proposal on Reactive Power Priority of Smart Inverters*" ("Staff Proposal"). The conclusion of the Staff Proposal is to modify Rule 21 tariff language to require reactive power priority from new generating facilities connecting under Rule 21, on and after January 1, 2018. In order to do so, generators are required to modify current Volt/VAR inverter settings from active power priority to reactive power priority.

At this stage, Sunrun believes it is premature to change the setting of the inverter power setting to reactive power priority by January 1, 2018. Sunrun supports safe and reliable functioning of the grid; however, there is no evidence for an immediate need to adopt reactive power priority. Changing Volt/VAR settings to reactive power priority has an economic impact today and will increasingly in the future on customers who install smart inverters and a change of this magnitude requires more deliberation and stakeholder input. Sunrun recommends considering the impact of all inverter settings in a more holistic manner in the Integrated Distributed Energy Resources ("IDER") Proceeding. SWIG should determine inverter capabilities but leave activation and valuation to the IDER so that inverter functionality is considered with respect to grid services. This in turn could impact the successor Net Energy Metering ("NEM") tariff.

The impact of reactive power priority on customers should not be ignored.

[1] Sunrun is the largest dedicated residential rooftop solar company in the United States. Since establishing the "solar as a service" model in 2007, Sunrun continues to lead the industry in providing clean energy to homeowners with little to no upfront cost and at a savings to traditional electric service. Sunrun designs, installs, finances, insures, monitors and maintains the solar panels on a homeowner's roof, while families receive predictable pricing for 20 years or more. Sunrun's BrightBox energy storage solution combines Sunrun's solar power generation with smart inverter technology and home battery storage to provide California homeowners with clean affordable energy.

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The Staff Proposal acknowledges that generators may experience a loss in real power with reactive power priority. The proposed range of power factors is +/-0.95, which corresponds to a maximum loss in real power of 5% (or 5% curtailment) for when reactive power is needed.

5% curtailment cannot be dismissed as insignificant. 5% curtailment can be impactful on production and project financing. The uncertainty around curtailment impacts the customer's ability to fund projects today and persists in the future as DER penetration increases.

Additionally, the CPUC and the utilities recognize that curtailment is a compensatory service. Utility RPS contracts include curtailment terms where the buyer pays the seller for unlimited or limited economic curtailment. Therefore, the impact of curtailment is meaningful and should be considered in a forum which considers inverter compensation, such as the Rule 21 interconnection proceeding.
On 21 July, 2017 the Commission opened a rulemaking[2] to explore whether to revise Rule 21 to streamline interconnection of DERs by incorporating the results of the Integration Capacity Analysis. The rulemaking specifically identifies the following issues related to inverter compensation in Track 1 and acknowledges that advanced inverter compensation might be scoped in the IDER or Net Energy Metering proceeding:

> 5) Activation via upgrade of Phase 1 capabilities in existing inverters with advanced functionality; 6) Rules and procedures for adjusting advanced inverter functions via communication controls; 7) Technical underpinnings of associated tariff and compensation issues for advanced inverters. This issue may need to be coordinated or jointly scoped with the Integrated Distributed Energy Resource and/or Net Energy Metering successor proceeding;[3]

The Staff Proposal's assertion that the curtailment issue can be addressed through oversizing inverters ignores the cost of larger inverters to customers. Inverter sizes are standardized in the industry. A customer will have to buy an inverter of a much larger size to account for 15% headroom and even spend on a main panel upgrade could be approximately $ 3000. Additionally this solution could preclude or reduce an opportunity for customers to be compensated for a service that they provide to the grid and results in a cost with no clear benefits.

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[2] http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M192/K079/192079467.PDF

[3] Order Institute Rulemaking To Consider Streamlining Interconnection Of Distributed Energy Resources And Improvements To Rule 21, July 13, 2017 (page 9)

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There is not enough evidence at this stage to mandate immediate reactive power priority from generating facilities or a clear benefit analysis that indicates that reactive power priority solves any grid problems.

Staff Proposal refers to the July 26, 2017, DNV –GL study titled, Residential Zero Net Energy Building Integration Cost Analysis. The study has indicated that smart inverters with reactive power priority may have a significant reduction in the grid integration costs of higher penetrations of PV on distribution circuits.
First the study was released on the same day as the Staff Proposal; therefore, stakeholders have not had any chance to vet or discuss the results of the study. Second, the study concludes that changing smart inverters' Volt /VAR setting from "real power priority" to "reactive power priority" would further reduce the high cost case significantly.[4] However, the study acknowledges that in the "High cost case," PV is clustered together at the end of a feeder which is a worst case scenario, and likely not realistic. This study should not be the basis for changing inverter settings to reactive power priority.

The Staff Proposal further reasons that hypothetically if future NEM policy were to require some or all grid upgrade costs of NEM systems to be borne by participant NEM customers, then NEM customers would have a self-interest to use reactive power priority or size their smart inverters larger. This is a broader issue and requires more discussion in the NEM successor tariff proceeding. Enabling reactive power priority pre-supposes that the hypothesis is accurate and eliminates any scope for discussion and valuation of reactive power versus grid upgrade costs. This also ignores that the state instituted NEM and exempted smaller customers from paying project specific upgrade costs. If the state has a changed point of view on that policy then that should be examined in the NEM proceeding. Most importantly, if the report recognizes that reactive power has a value, then it should be further debated before imposing mandatory reactive power priority on all inverters.

The utilities have not presented any data or empirical evidence that suggests a need for immediate reactive power priority applicable to all customers across all feeders. Such analysis is necessary so that stakeholders may evaluate and provide comment before the Commission considers adopting a new requirement that would be costly to customers. Furthermore clear utility vision on how the activation of advanced functions will affect the interconnection process, hosting capacity analysis and upgrade deferral is needed in order for all stakeholders to benefit from the activation of setting like reactive power priority.

[4] Residential Zero Net Energy Building Integration Cost Analysis. DNV GL

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The Staff Proposal further reasons that jurisdictions in Hawaii and Europe have instituted reactive power. Different states and territories have different policies based on the conditions of their respective grid. California has a much lower DER penetration than Hawaii. For example, this study included a circuit starting with a current PV penetration in relation to estimated gross daytime minimum load at 150% that grows to 635%. The Staff proposal ignores that the Hawaiian Electric Companies and NREL collaborated to achieve a recommended approach through a Hawaii circuit specific study that looked at some of the following questions in order to institute reactive power priority. Specifically,

1. Which advanced inverter function is more effective in regulating voltage?
2. What is the relative impact of the advanced inverter voltage-regulation functions in customer-sited PV system kilowatt-hour (kWh) reduction?
3. What is the relative impact of advanced inverter voltage-regulation functions in overall feeder reactive power demand?
4. Is active or reactive power priority the right implementation for Hawai'i?[5]

The Commission should consider a more holistic and deliberate approach in implementing advanced inverter functionality.

The SIWG has methodically pursued development of advanced inverter functionality over three phases. Phase 1 considered autonomous functions which will be implemented September 2017. Phase 2 considered the default protocols for communications between IOUs, DERs, and DER aggregators which will be implemented on or after March 2018. Phase 3 is currently considering additional advanced inverter functionality. Sunrun recommends considering reactive power priority in relation to the other eight (8) Phase 3 functions that are recommended to be included in Rule 21 as mandatory or optional capabilities for all inverter-based DER systems.

The SWIG was established in early 2013. Since then many things have changed. Primary among them is the utility's move towards grid modernization and the activities in the IDER proceeding.

On December 15, 2016, the Commission adopted Decision ("D.")16.-12-036[6], which approved a competitive solicitation framework and a utility regulatory incentive mechanism pilot which will facilitate the deployment of DERs to displace or defer the need for capital expenditures on traditional distribution infrastructure. The Decision

[5] Simulation of Hawaiian Electric Companies Feeder Operations with Advanced Inverters and Analysis of Annual Photovoltaic Energy Curtailment (NREL Study

[6] http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M171/K555/171555623.PDF

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specifically identifies voltage support as a service that should be compensated through the competitive solicitation framework. Specifically,

> Voltage Support services are substation and/or feeder-level dynamic voltage management services provided by an individual resource and/or aggregated resources capable of dynamically correcting excursions outside voltage limits as well as supporting conservation voltage reduction strategies in coordination with utility voltage/reactive power control systems.

Inverter settings should not preclude or interfere with a potential voltage support service identified by a CPUC Decision. Both reactive and active power have market value. Reactive power support should be further discussed in the IDER and DRP proceeding. The SWIG should determine capabilities but leave activation to the IDER so that inverter functionality is considered with respect to grid services .This in turn could feed into the successor NEM tariff.

Respectfully submitted,

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